STORMWATER MANAGEMENT DESIGN

FOR

VETERINARY CLINIC

Howey in the Hills, Florida 33629 Project No. 2023.179

August 22nd, 2025

PREPARED BY



1201 E. ROBINSON STREET ORLANDO, FL 32801 PH: 407 271 8910



Robert Ziegenfuss c=US, o=Z Development Services, dnQualifier=A01410D00000190EA6 802BC000371EF, cn=Robert Ziegenfuss 2025.08.26 11:59:24 -04'00'

ROBERT ZIEGENFUSS, P.E. FL REG. #56752

This item has been digitally signed and sealed by ROBERT ZIEGENFUSS on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed, and the signature must be verified on any electronic copies.

STORMWATER MANAGEMENT DESIGN

TABLE OF CONTENTS

I. PROJECT NARRATIVE

II. EXISTING CONDITIONS

- A. 100-Year Flood Zone
- B. Wetlands
- C. Existing Zoning and Land Use
- D. Soil and Groundwater Conditions
- E. Existing Drainage Basins and Time of Concentration
- F. Tailwater Conditions and Positive Outfall

III. PROPOSED CONDITIONS

- A. Review and Permitting Agencies
- B. Stormwater Management System Design
- C. Water Quality Treatment Volume and Recovery
- D. Design Storm Attenuation

IV. DESIGN CALCULATIONS

- A. Site Area and Drainage Basins
- B. Nitrogen and Phosphorous Requirements

V. MAINTENANCE OF RETENTION/DETENTION FACILITIES

VI. FIGURES

- A. Aerial Photo
- B. USGS Map
- C. FEMA Map
- D. NRCS Soils Map
- E. Pre-Development Drainage Map
- F. Post-Development Drainage Map

VII. COMPUTER MODELING RESULTS

- A. Water Quality Treatment Volume Requirements
- B. PONDS 3.3 Modeling Recovery
- C. ICPR4 Modeling for Pre/Post
- D. Nitrogen and Phosphorus Removal Modeling

VIII. GEOTECHNICAL INVESTIGATION

I. PROJECT NARRATIVE

The proposed development includes the construction of a 6,000 SF, one-story veterinary clinic with associated parking and utilities. The proposed project drainage area is 3.06 acres in size. The stormwater management system will be a dry retention system. The stormwater management system is designed according to the City of Howey in the Hills and the St. Johns River Water Management District (SJRWMD) requirements.

II. EXISTING CONDITIONS

The site is currently undeveloped with ground cover consisting of short grass, vegetation and some trees. There are no buildings or other major improvements on the site. There is no existing stormwater management system on the subject site. This area has no outfall and is a closed basin.

A. 100-Year Flood Zone

The site lies in flood zone "X" based on flood insurance rate map number 12069C0485E, effective December 18th, 2012, for Lake County, FL. A small portion of the site in zone A, which is the edge of an existing flood line. There is a portion of the site within the 100-yr flood zone line, below an elevation of 87.30'. The property's point of outfall is the existing water body located on the west side of the site.

B. Wetlands

There is currently a water body located on the west side of the property. The current water level is at elevation 80.00' and has a flood zone elevation of 83.70', as determined by Pegasus Engineering. This flood zone line is what composes the post development drainage basin named Flood Zone Basin.

C. Existing Zoning and Land Use

The zoning is NC (Neighborhood Commercial Zoning). Current land use is vacant.

D. Soil and Groundwater Conditions

According to the NRCS Web Soils map, the site is composed of approximately 57.9% by #5 Apopka sand and 28.2% by #45 Tavares sand.

E. Existing Drainage Basins and Time of Concentration

All water sheet flows west over the site from the state road 19 right-of-way and discharges to the existing water body located west of the site. The site is divided into two existing basins, one is the Flood Zone basin that is delineated by the 100-year flood zone and the other is the undeveloped upland basin, composed by the usable land that will be constructed upon.

The pre-development time of concentration of 29 minutes (Section VIII, C) was determined using the TR-55 Manual. It was used 10 minutes as the post-development time of concentration.

F. Tailwater Conditions and Positive Outfall

The outfall condition is free discharge. The discharge occurs above the existing flood zone elevation.

III. PROPOSED DEVELOPMENT

A. Review and Permitting Agencies

- SJRWMD
- Town of Howey in the Hills

B. Stormwater Management System Design

While the flood zone basin remains the same in the pre and post development conditions. The developed portion of the site will be divided into three post development basins. These basins are as follows: Future Development Basin (parcel of land remaining for future development), Post Site Basin (current area for the veterinary office construction) and Direct Basin (portion of the constructed site that drains straight to the ultimate outfall). All three basins are ultimately discharged to the same outfall. The proposed condition will store the treatment volume using a dry retention system, and the point of discharge will be the existing flood zone area using a 0.7 ft x 0.3 ft rectangular weir to discharge overland through the flood zone basin which will ultimately discharge into the existing water body west of the site.

C. Water Quality Treatment Volume (WQTV) and Recovery

The nutrient loading treatment is achieving net improvement with 0.9 inches of treatment volume. The required treatment volume is 10,013 CF. This volume is met in the dry retention system at elevation 87.81′. The vertical weir is proposed at elevation 90.30′, with a retained treatment volume of 48,547 CF, which recovers in 14 days.

D. Design Storm Attenuation

SWFWMD requires 2YRS-24 HRS, 10 YRS-24 HRS, 25 YRS-24 HRS, 100 YRS-24HRS. We have confirmed that there is no increase in rate or volume discharged from the pre to post development conditions.

Storm Event	Pre-Development	Post-Development	Post-Development	
	Discharge (cfs)	Discharge (cfs)	Max Stage (ft)	
2-Year 24-Hour	0.02	0.00	88.63	
10-Year 24-Hour	0.27	0.14	89.56	
25-Year 24-Hour	0.90	0.48	90.31	
25-Year 96-Hour	2.34	0.79	90.76	
100-Year 24-Hour	2.87	1.38	90.94	

Storm Event	Pre-Development Volume	Post-Development Volume
	Discharged (CF)	Discharged (CF)
2-Year 24-Hour	689	110
10-Year 24-Hour	4880	757
25-Year 24-Hour	10545	1626
25-Year 96-Hour	26006	24475
100-Year 24-Hour	25109	18343

IV. DESIGN CALULATIONS

A. Site Area and Drainage Basins

Existing Conditions

UNDEVELOPED BASIN

Site / Development Area (SF)	133,502
Total Basin Area (SF)	133,502
Weighted CN	39
Total Basin Impervious Areas (SF)	0
Directly Connected Impervious Area (DCIA), Percent	0
Time of Concentration, Tc (minutes)	29

For sheet flow of less than 300 feet, use Manning's kinematic solution (Overtop and Meadows 1976) to compute T_t:

$$T_{t} = \frac{0.007(nL)^{0.8}}{(P_{2})^{0.5}s^{0.4}}$$
 [eq. 3-3]

 $Tt = (0.007*(0.4*255)^0.8) / (4.18^0.5*0.044^0.4) = 0.483 \text{ hours} = 29 \text{ minutes}.$

Proposed Conditions

FUTURE DEVELOPMENT BASIN

Site / Development Area (SF)	133,502
Total Basin Area (SF)	42,383
Weighted CN	86
Total Basin Impervious Areas (SF)	33,906
Directly Connected Impervious Area (DCIA), Percent	80
Time of Concentration, Tc (minutes)	10

POST SITE BASIN

Site / Development Area (SF)	133,502
Total Basin Area (SF)	70,960
Weighted CN	71
Total Basin Impervious Areas (SF)	38,725
Directly Connected Impervious Area (DCIA), Percent	54.6
Time of Concentration, Tc (minutes)	10

DIRECT BASIN

Site / Development Area (SF)	133,502
Total Basin Area (SF)	20,159
Weighted CN	39
Total Basin Impervious Areas (SF)	0
Directly Connected Impervious Area (DCIA), Percent	0
Time of Concentration, Tc (minutes)	10

The proposed minimum pavement elevation is 96.30′. The proposed minimum finish floor elevation is 97.80′.

B. Nitrogen and Phosphorous Requirement

The proposed retention pond is designed for treatment and nutrient removal. The detailed calculations for the phosphorous and nitrogen removal efficiencies are attached to this report under (Section VII, D).

V. MAINTENANCE INSTRUCTIONS FOR RETENTION/DETENTION PONDS

- ✓ Inlets and pipes shall be kept free of trash, silt, soil and leaves. Inspect the inlets at least annually, and jet/vacuum the system as needed.
- ✓ The outfall structure shall be kept free of trash and debris. The required skimmer shall be inspected annually to ensure it is free of debris. Repair the skimmer as needed.
- ✓ Oils, paints, or other harmful chemicals shall be kept from the facilities. Any such materials entering the system shall be immediately removed. Contact a qualified environmental company to dispose of any harmful chemicals.
- ✓ During the earthwork, erosion protection such as hay bale, turbidity curtains and others shall be placed at inlets and outlet pipes to control stormwater quality and turbidity. Any silt washed into the pond during the construction process should be removed and the pond bottom scarified prior to seeding.
- ✓ Inspections shall be made at least annually to check sump-type catch basins for major build-up of sedimentation or trash. The catch basins shall be cleaned if the sedimentation level in the sump is 6 inches or greater. The sediment may be vacuumed, pumped, or manually removed from the basin.
- ✓ Remove grate or lid and remove sediment that has entered the control structure.

VI. FIGURES

FIGURE A – AERIAL PHOTO



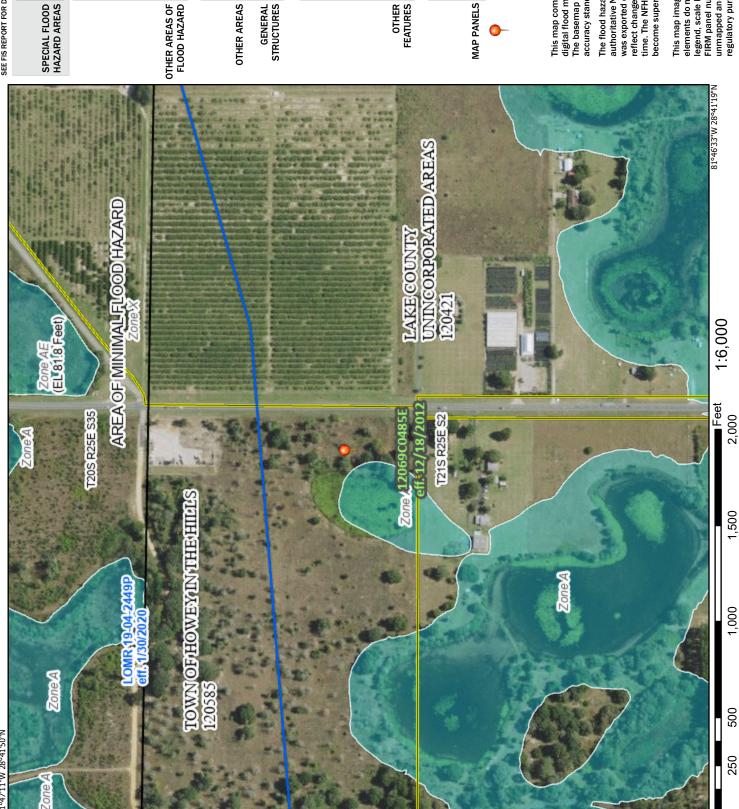
FIGURE B – USGS MAP



FIGURE C – FEMA FIRMETTE

National Flood Hazard Layer FIRMette





Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

With BFE or Depth Zone AE, AO, AH, VE, AR Without Base Flood Elevation (BFE)

Regulatory Floodway

0.2% Annual Chance Flood Hazard, Areas depth less than one foot or with drainage areas of less than one square mile Zone X of 1% annual chance flood with average

Future Conditions 1% Annual

Area with Reduced Flood Risk due to Chance Flood Hazard Zone X Levee. See Notes. Zone X

Area with Flood Risk due to Levee Zone D

NO SCREEN Area of Minimal Flood Hazard Zone X

Effective LOMRs

Area of Undetermined Flood Hazard Zone D

OTHER AREAS

Channel, Culvert, or Storm Sewer GENERAL | ---- Channel, Culvert, or Storr STRUCTURES | 1111111 Levee, Dike, or Floodwall Cross Sections with 1% Annual Chance Water Surface Elevation Coastal Transect

Base Flood Elevation Line (BFE) Limit of Study mm 513 mm

Coastal Transect Baseline

Hydrographic Feature

OTHER FEATURES

No Digital Data Available Digital Data Available

Unmapped

MAP PANELS

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

authoritative NFHL web services provided by FEMA. This map reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or The flood hazard information is derived directly from the was exported on 8/10/2023 at 2:38 PM and does not become superseded by new data over time. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

FIGURE D - NRCS SOILS MAP

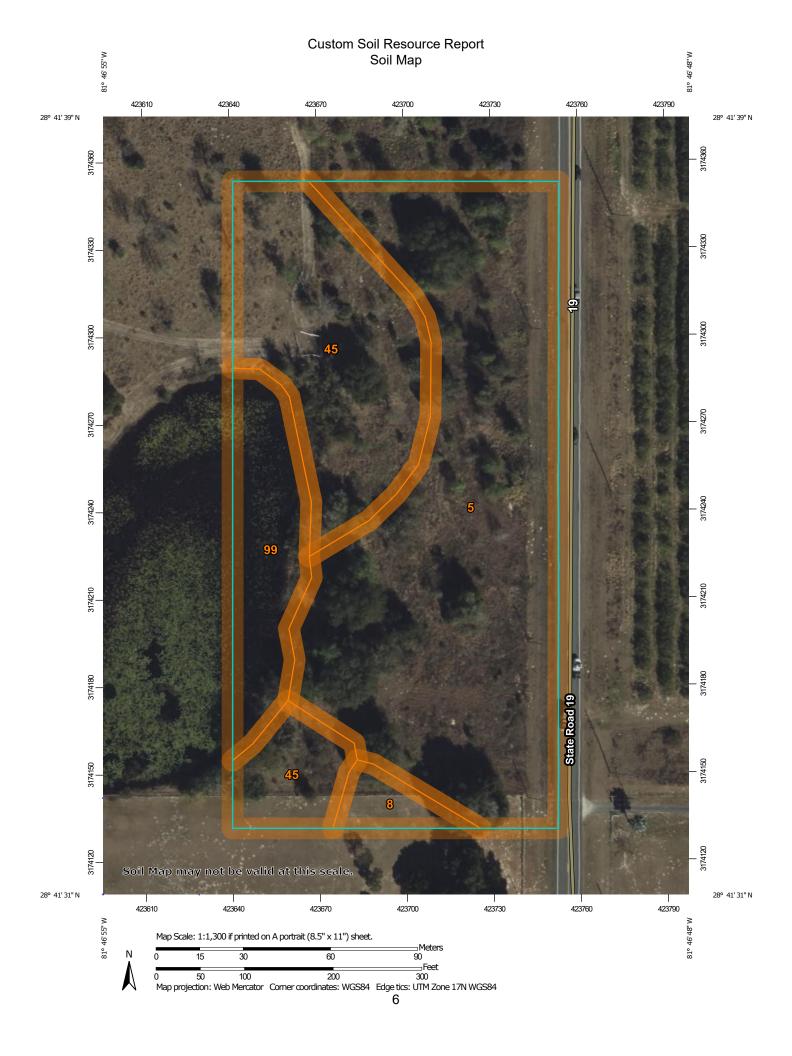


FIGURE E – PRE DEVELOPMENT BASIN MAP

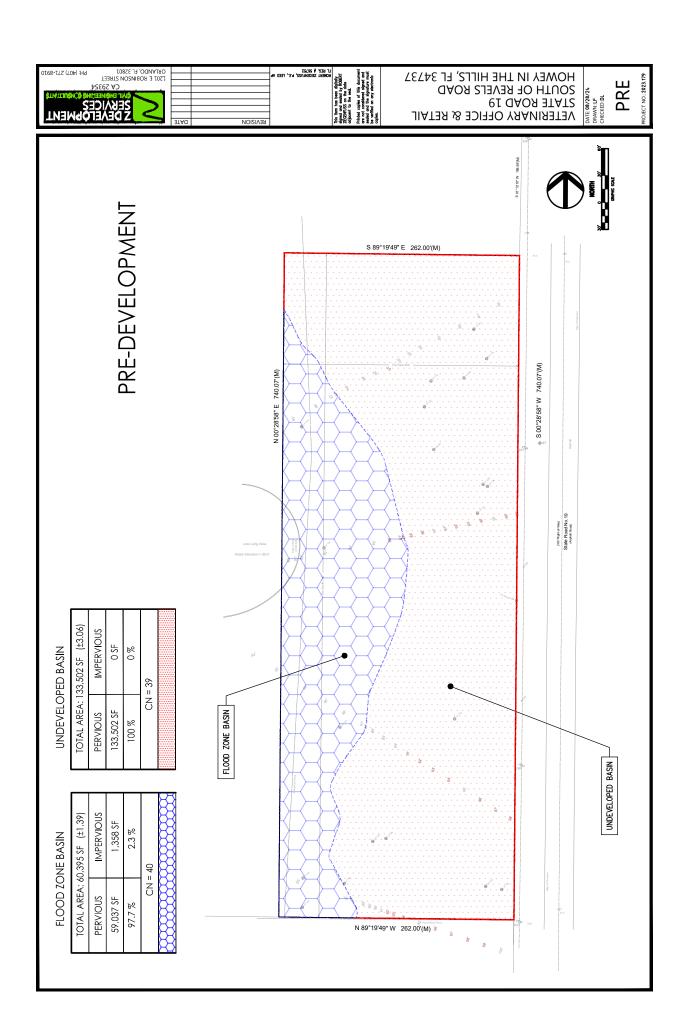
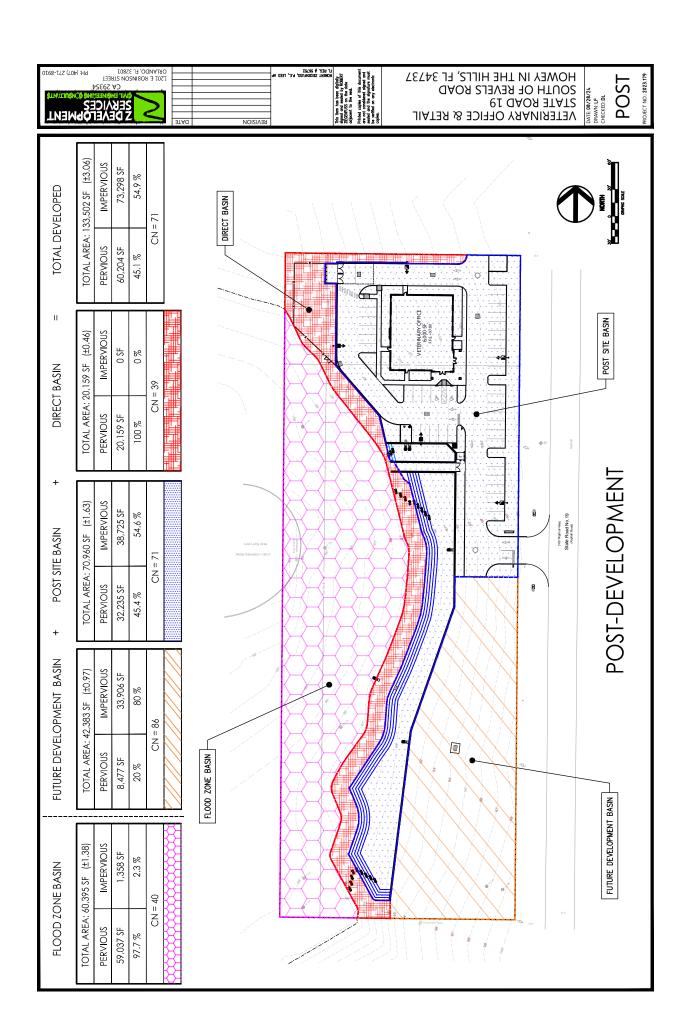


FIGURE F – POST DEVELOPMENT BASIN MAP



VII. COMPUTER MODELING RESULTS

A. WATER QUALITY TREATMENT VOLUME REQUIREMENTS

Treatment Volume

Veterinary Clinic

Howey in the Hills, FL # 2023.179

On-Line- SJRWMD

Site Information

133,502 Total Site Area, sf 51,907 Green Area, sf 81,595 Impervious with Road, sf 0.90 Runoff, in.

10,013 Treatment Volume, cf

Stage - Storage Summary

Elevation	POND 1	15in PIPE	18in PIPE	24in PIPE	Total Area (sf)	incr. volume	cum. volume cubic feet	Area ACRES
		0	0	0	0	0	0	0.000
		0	0	0	0	0	0	0.000
		0	0	0	0	0	0	0.000
		0	0	0	0	0	0	0.000
		0	0	0	0	0	0	0.000
87.00	11,516	0	0	0	11,516	0	0	0.264
88.00	13,082	0	0	0	13,082	12,299	12,299	0.300
89.00	14,683	0	0	0	14,683	13,883	26,182	0.337
90.00	16,321	0	0	0	16,321	15,502	41,684	0.374
91.00	17,994	0	0	0	17,994	17,158	58,841	0.413
								1

Required Treatment Volume, cf 10,013
is Available at Elevation 87.81

Weir @ 90.3
Volume 46831 CF
Area 16823 SF

2023.179 Treatment Volume 7/28/2025 12:22 PM

B. PONDS 3.3 MODELING FOR RECOVERY

PONDS Version 3.3.0265 Retention Pond Recovery - Refined Method Copyright 2012 Devo Seereeram, Ph.D., P.E.

Project Data

Project Name: Veterinary Clinic

Simulation Description:

Project Number: 2023.179
Engineer: Leonardo

Supervising Engineer:

Date: 07-16-2025

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum):	80.00
Water Table Elevation, [WT] (ft datum):	85.50
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	10.80
Fillable Porosity, [n] (%):	25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day):	13.0
Maximum Area For Unsaturated Infiltration, [Av] (ft²):	16823.0

Geometry Data

Equivalent Pond Length, [L] (ft): 460.0

Equivalent Pond Width, [W] (ft): 40.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)		
(it datairi)	(it)		
87.00	11516.0		
88.00	13082.0		
89.00	14683.0		
90.00	16321.0		
91.00	17994.0		

Veterinary Clinic 08-04-2025 10:51:15 Page 1

PONDS Version 3.3.0265 **Retention Pond Recovery - Refined Method** Copyright 2012 Devo Seereeram, Ph.D., P.E.

Scenario Input Data

Scenario 1 :: 14 Day Recovery

Slug Load

Hydrograph Type: Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 46831

Initial ground water level (ft datum) 85.50 (default)

Time After Storm Event (days)			Time After Storm Event (days)	
0.100	2.000	5.000	10.000	
0.250	2.500	6.000	11.000	
0.500	3.000	7.000	12.000	
1.000	3.500	8.000	13.000	
1.500	4.000	9.000	14.000	

PONDS Version 3.3.0265 Retention Pond Recovery - Refined Method Copyright 2012 Devo Seereeram, Ph.D., P.E.

<u>Detailed Results</u> :: Scenario 1 :: 14 Day Recovery

Elapsed Time	Instantaneous Inflow Rate	Outside Recharge	Stage Elevation	Infiltration Rate	Combined Instantaneous Discharge	Cumulative Inflow	Cumulative Infiltration	Combined Cumulative	
0.000	7805.1670	0.00000	85.50000	0.00000	0	0.000	0.00000	0	N.A.
0.002	7805.1670	0.00000	90.30955	2.53063	0	46831.000	15.18743	0	U/P
2.400	0.0000	0.00000	89.42386	1.10127	0	46831.000	14278.88000	0	U/S
6.000	0.0000	0.00000	89.18954	0.23163	0	46831.000	17837.11000	0	S
12.000	0.0000	0.00000	88.95593	0.13888	0	46831.000	21295.03000	0	S
24.000	0.0000	0.00000	88.66617	0.08238	0	46831.000	25461.96000	0	S
36.000	0.0000	0.00000	88.45511	0.06046	0	46831.000	28412.44000	0	S
48.000	0.0000	0.00000	88.28893	0.04762	0	46831.000	30685.37000	0	S
60.000	0.0000	0.00000	88.15184	0.03918	0	46831.000	32527.14000	0	S
72.000	0.0000	0.00000	88.03522	0.03318	0	46831.000	34070.15000	0	S
84.000	0.0000	0.00000	87.93386	0.02870	0	46831.000	35393.80000	0	S
96.000	0.0000	0.00000	87.84433	0.02502	0	46831.000	36549.51000	0	S
120.000	0.0000	0.00000	87.69797	0.01971	0	46831.000	38411.77000	0	S
144.000	0.0000	0.00000	87.57465	0.01649	0	46831.000	39954.86000	0	S
168.000	0.0000	0.00000	87.46868	0.01408	0	46831.000	41261.67000	0	S
192.000	0.0000	0.00000	87.37624	0.01221	0	46831.000	42387.47000	0	S
216.000	0.0000	0.00000	87.29456	0.01072	0	46831.000	43370.86000	0	S
240.000	0.0000	0.00000	87.22168	0.00951	0	46831.000	44239.70000	0	S
264.000	0.0000	0.00000	87.15607	0.00852	0	46831.000	45014.67000	0	S
288.000	0.0000	0.00000	87.09657	0.00769	0	46831.000	45711.66000	0	S
312.000	0.0000	0.00000	87.04228	0.00648	0	46831.000	46342.70000	0	S
336.000	0.0000	0.00000	86.98689			46831.000	46831.00000	0	N.A.

Veterinary Clinic 08-04-2025 10:51:17 Page 3

C. ICPR4 MODELING FOR PRE/POST

Simple Basin: DIRECT BASIN

Scenario: Scenario1

Node: POST OUTFALL

Hydrograph Method: NRCS Unit Hydrograph

Infiltration Method: Curve Number Time of Concentration: 10.0000 min

Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0

Area: 0.4600 ac

Curve Number: 39.0
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment:

Simple Basin: FUTURE DEVELOPMENT BASIN

Scenario: Scenario1

Node: SITE POND

Hydrograph Method: NRCS Unit Hydrograph

Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs

Time Shift: 0.0000 hr Unit Hydrograph: UH484 Peaking Factor: 484.0

Area: 0.9700 ac

Curve Number: 39.0
% Impervious: 80.00
% DCIA: 80.00
% Direct: 0.00

Rainfall Name:

Comment:

Simple Pasin, DOST SITE BASI

Scenario: Scenario1

Node: SITE POND

Hydrograph Method: NRCS Unit Hydrograph

Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs

Time Shift: 0.0000 hr Unit Hydrograph: UH484 Peaking Factor: 484.0 Area: 1.6300 ac

Curve Number: 71.0 % Impervious: 0.00 % DCIA: 0.00 % Direct: 0.00 Rainfall Name:

Comment:

Scenario: Scenario1 Node: PRE OUTFALL

Hydrograph Method: NRCS Unit Hydrograph Infiltration Method: Curve Number

Time of Concentration: 29.0000 min

Max Allowable Q: 0.00 cfs Time Shift: 0.0000 hr

Unit Hydrograph: UH256 Peaking Factor: 256.0

Area: 3.0600 ac

Curve Number: 39.0 % Impervious: 0.00 % DCIA: 0.00 % Direct: 0.00

Rainfall Name:

Comment:

Scenario: Scenario1 Type: Time/Stage Base Flow: 0.00 cfs Initial Stage: 80.00 ft Warning Stage: 80.10 ft

Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	80.00
0	0	0	100.0000	80.00

Comment:

Node: PRE OUTFALL

Scenario: Scenario1 Type: Time/Stage Base Flow: 0.00 cfs Initial Stage: 80.00 ft Warning Stage: 80.10 ft

Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	80.00
0	0	0	100.0000	80.00

Comment:

Node: SITE POND

Scenario: Scenario1
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 87.00 ft
Warning Stage: 91.00 ft

Stage [ft]	Area [ac]	Area [ft2]
87.00	0.2644	11517
88.00	0.3003	13081
89.00	0.3371	14684
90.00	0.3747	16322
91.00	0.4131	17995

Comment:

Weir Link: WEIF

Scenario: Scenario1
From Node: SITE POND
To Node: POST OUTEAU

To Node: POST OUTFALL Link Count: 1

Flow Direction: Both
Damping: 0.0000 ft

Weir Type: Broad Crested Vertical Geometry Type: Rectangular

Invert: 90.30 ft Control Elevation: 90.30 ft

Max Depth: 0.70 ft
Max Width: 0.30 ft

Fillet: 0.00 ft

Bottom Clip
Default: 0.00 ft

Op Table: Ref Node:

Default: 0.00 ft

Op Table: Ref Node:

Discharge Coefficien

Weir Default: 2.800 Weir Table:

Orifice Default: 0.800
Orifice Table:

Comment:

Simulation: 002 Yrs - 24 Hrs

Scenario: Scenario1

Run Date/Time: 7/23/2025 11:08:31 AM

Program Version: ICPR4 4.07.08

General

Run Mode: Normal

_	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000

Hydrology [sec] Surface Hydraulics [sec]

Min Calculation Time: 60.0000 0.1000

Max Calculation Time: 30.0000

Output Time Increments

Hvdroloav

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resource

Rainfall Folder:

Unit Hydrograph Folder:

Lookun Tahles

Boundary Stage Set: Extern Hydrograph Set: Curve Number Set:

> Green-Ampt Set: Vertical Layers Set: Impervious Set:

Tolerances & Options

Time Marching: SAOR IA Recovery Time: 24.0000 hr

Max Iterations: 6
Over-Relax Weight 0.5 dec

Fact:

dZ Tolerance: 0.0010 ft

Smp/Man Basin Rain Global

Opt:

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft Rainfall Name: ~SCSII-24

Rainfall Amount: 4.18 in

Edge Length Option: Automatic Storm Duration: 24.0000 hr

Dflt Damping (1D): 0.0050 ft Min Node Srf Area 100 ft2

(1D):

Energy Switch (1D): Energy

Comment:

Simulation: 010 Yrs - 24 Hrs

Min Calculation Time:

Scenario: Scenario1

Run Date/Time: 7/23/2025 11:08:34 AM

Program Version: ICPR4 4.07.08

Genera

Run Mode: Normal

_	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000

 Hydrology [sec]
 Surface Hydraulics [sec]

 60.0000
 0.1000

Max Calculation Time: 30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resource

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set: Extern Hydrograph Set: Curve Number Set:

> Green-Ampt Set: Vertical Layers Set: Impervious Set:

Tolerances & Options

Time Marching: SAOR IA Recovery Time: 24.0000 hr

Max Iterations: 6
Over-Relax Weight 0.5 dec

Fact:

dZ Tolerance: 0.0010 ft Smp/Man Basin Rain Global

Opt:

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft Rainfall Name: ~SCSII-24

Rainfall Amount: 6.03 in

Edge Length Option: Automatic Storm Duration: 24.0000 hr

Dflt Damping (1D): 0.0050 ft Min Node Srf Area 100 ft2

(1D):

Energy Switch (1D): Energy

Comment:

Simulation: 025 Yrs - 24 Hrs

Scenario: Scenario1

Run Date/Time: 7/23/2025 11:08:39 AM

Program Version: ICPR4 4.07.08

General

Run Mode: Normal

 Year
 Month
 Day
 Hour [hr]

 Start Time:
 0
 0
 0
 0.0000

 End Time:
 0
 0
 0
 24.0000

Max Calculation Time: 30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set: Extern Hydrograph Set: Curve Number Set:

> Green-Ampt Set: Vertical Layers Set: Impervious Set:

Tolerances & Options

Time Marching: SAOR

Max Iterations: 6
Over-Relax Weight 0.5 dec

Fact:

dZ Tolerance: 0.0010 ft

Smp/Man Basin Rain Global

Opt:

IA Recovery Time: 24.0000 hr

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft

Rainfall Name: ~SCSII-24
Rainfall Amount: 7.55 in

Edge Length Option: Automatic St

Storm Duration: 24.0000 hr

Dflt Damping (1D): 0.0050 ft Min Node Srf Area 100 ft2

(1D):

Energy Switch (1D): Energy

Comment:

Simulation: 025 Yrs - 96 Hrs

Scenario: Scenario1

Min Calculation Time:

Run Date/Time: 7/23/2025 11:08:46 AM

Program Version: ICPR4 4.07.08

General

Run Mode: Normal

_	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	96.0000

 Hydrology [sec]
 Surface Hydraulics [sec]

 60.0000
 0.1000

Max Calculation Time: 30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Table

Resource

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set: Extern Hydrograph Set: Curve Number Set:

> Green-Ampt Set: Vertical Layers Set: Impervious Set:

Tolerances & Options

Time Marching: SAOR IA Recovery Time: 24.0000 hr

Max Iterations: 6
Over-Relax Weight 0.5 dec

Fact:

dZ Tolerance: 0.0010 ft Smp/Man Basin Rain Global

Opt:

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft Rainfall Name: ~SJRWMD-96

Rainfall Amount: 10.50 in Storm Duration: 96.0000 hr

Edge Length Option: Automatic Storm Duration: 96.0000 hr

Dflt Damping (1D): 0.0050 ft Min Node Srf Area 100 ft2

(1D):

Energy Switch (1D): Energy

Comment:

Simulation: 100 Yrs - 24 Hrs

Scenario: Scenario1

Run Date/Time: 7/23/2025 11:09:05 AM Program Version: ICPR4 4.07.08

Genera

Run Mode: Normal

_	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000

 Hydrology [sec]
 Surface Hydraulics [sec]

 60.0000
 0.1000

Min Calculation Time: 60.0000 0.1000

Max Calculation Time: 30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Rainfall Folder:

Resources & Lookup Tables

Resources

Lookup Tables

Boundary Stage Set:

Unit Hydrograph

Folder:

Extern Hydrograph Set: Curve Number Set:

> Green-Ampt Set: Vertical Layers Set: Impervious Set:

Tolerances & Options

Time Marching: SAOR IA Recovery Time: 24.0000 hr

Max Iterations: 6
Over-Relax Weight 0.5 dec

Fact:

dZ Tolerance: 0.0010 ft Smp/Man Basin Rain Global

Opt:

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft Rainfall Name: ~SCSII-24

Rainfall Amount: 10.40 in

Edge Length Option: Automatic Storm Duration: 24.0000 hr

Dflt Damping (1D): 0.0050 ft Min Node Srf Area 100 ft2

(1D):

Energy Switch (1D): Energy

Comment:

Node Max Conditions [Scenario1]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
				[ft]			
POST	002 Yrs - 24	80.10	80.00	0.0000	0.00	0.00	0
OUTFALL	Hrs						
PRE OUTFALL	002 Yrs - 24	80.10	80.00	0.0000	0.02	0.00	0
	Hrs						
SITE POND	002 Yrs - 24	91.00	88.63	0.0010	6.94	0.00	14087
	Hrs						
POST	010 Yrs - 24	80.10	80.00	0.0000	0.14	0.00	0
OUTFALL	Hrs						
PRE OUTFALL	010 Yrs - 24	80.10	80.00	0.0000	0.27	0.00	0
	Hrs						
SITE POND	010 Yrs - 24	91.00	89.56	0.0010	11.69	0.00	15598
	Hrs						
POST	025 Yrs - 24	80.10	80.00	0.0000	0.48	0.00	0
OUTFALL	Hrs						
PRE OUTFALL	025 Yrs - 24	80.10	80.00	0.0000	0.90	0.00	0
	Hrs						

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
SITE POND	025 Yrs - 24 Hrs	91.00	90.31	[ft] 0.0010	15.87	0.00	16838
POST OUTFALL	025 Yrs - 96 Hrs	80.10	80.00	0.0000	0.79	0.00	0
PRE OUTFALL	025 Yrs - 96 Hrs	80.10	80.00	0.0000	2.34	0.00	0
SITE POND	025 Yrs - 96 Hrs	91.00	90.76	0.0010	12.15	0.26	17587
POST OUTFALL	100 Yrs - 24 Hrs	80.10	80.00	0.0000	1.38	0.00	0
PRE OUTFALL	100 Yrs - 24 Hrs	80.10	80.00	0.0000	2.87	0.00	0
SITE POND	100 Yrs - 24 Hrs	91.00	90.94	0.0010	23.97	0.43	17888

Node Mass Balance Condensed [Scenario1]

Node Name	Sim Name	Total Inflow [ft3]	Total Outflow [ft3]	Stored Volume (Flow Based) [ft3]
POST OUTFALL	002 Yrs - 24 Hrs	110	0	110
POST OUTFALL	010 Yrs - 24 Hrs	757	0	757
POST OUTFALL	025 Yrs - 24 Hrs	1626	0	1626
POST OUTFALL	025 Yrs - 96 Hrs	24475	0	24475
POST OUTFALL	100 Yrs - 24 Hrs	18343	0	18343

Node Mass Balance Condensed [Scenario1]

Node Name	Sim Name	Total Inflow [ft3]	Total Outflow [ft3]	Stored Volume (Flow Based) [ft3]		
				Dasca) [It3]		
PRE OUTFALL	002 Yrs - 24 Hrs	689	0	689		
PRE OUTFALL	010 Yrs - 24 Hrs	4880	0	4880		
PRE OUTFALL	025 Yrs - 24 Hrs	10545	0	10545		
PRE OUTFALL	025 Yrs - 96 Hrs	26006	0	26006		
PRE OUTFALL	100 Yrs - 24 Hrs	25109	0	25109		

D. NITROGEN & PHOSPHOUROUS REMOVAL MODELING

Complete Report (not including cost) Ver 4.2.3

Project: 2023.179 Veterinary Clinic Date: 8/2/2025 11:44:56 AM

Site and Catchment Information

Analysis: Specified Removal Efficiency

Catchment Name POST SITE
Rainfall Zone Florida Zone 2

Annual Mean Rainfall 50.00

Pre-Condition Landuse Information

Landuse	Undeveloped - Scrubby Flatwoods: TN=1.155 TP=0.027
Area (acres)	3.06
Rational Coefficient (0-1)	0.01
Non DCIA Curve Number	39.00
DCIA Percent (0-100)	0.00
Nitrogen EMC (mg/l)	1.155
Phosphorus EMC (mg/l)	0.027
Runoff Volume (ac-ft/yr)	0.082
Nitrogen Loading (kg/yr)	0.116
Phosphorus Loading (kg/yr)	0.003

Post-Condition Landuse Information

Landuse	Low-Intensity Commercial: TN=1.13 TP=0.188
Area (acres)	3.06
Rational Coefficient (0-1)	0.45
Non DCIA Curve Number	39.00
DCIA Percent (0-100)	54.90
Wet Pond Area (ac)	0.00
Nitrogen EMC (mg/l)	1.130
Phosphorus EMC (mg/l)	0.188
Runoff Volume (ac-ft/yr)	5.699
Nitrogen Loading (kg/yr)	7.941
Phosphorus Loading (kg/yr)	1.321

Catchment Number: 1 Name: POST SITE

Project: 2023.179 Veterinary Clinic

Date: 8/2/2025

Retention Design

Retention Depth (in) 0.900 Retention Volume (ac-ft) 0.230

Watershed Characteristics

Catchment Area (acres) 3.06 Contributing Area (acres) 3.060 Non-DCIA Curve Number 39.00 DCIA Percent 54.90

Rainfall Zone Florida Zone 2

Rainfall (in) 50.00

Surface Water Discharge

Required TN Treatment Efficiency (%) 80 Provided TN Treatment Efficiency (%) 83 Required TP Treatment Efficiency (%) 55 Provided TP Treatment Efficiency (%) 83

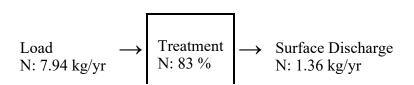
Media Mix Information

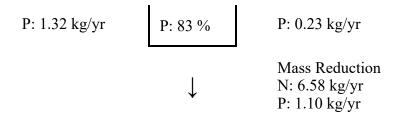
Type of Media Mix Not Specified Media N Reduction (%)
Media P Reduction (%)

Groundwater Discharge (Stand-Alone)

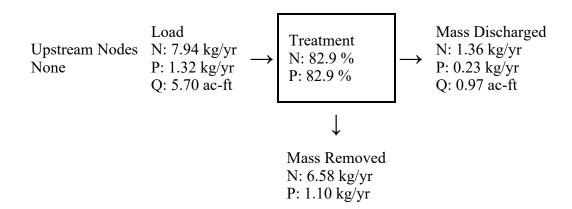
Treatment Rate (MG/yr) 0.000
TN Mass Load (kg/yr) 6.584
TN Concentration (mg/L) 0.000
TP Mass Load (kg/yr) 1.095
TP Concentration (mg/L) 0.000

Load Diagram for Retention (stand-alone)





Load Diagram for Retention (As Used In Routing)



Summary Treatment Report Version: 4.2.3

Project: 2023.179 Veterinary

Clinic

Analysis Type: Specified Removal Date:8/2/2025

Efficiency

BMP Types: Routing Summary

Catchment 1 - (POST SITE) Catchment 1 Routed to Outlet

Retention

Based on % removal values to the

nearest percent

Total nitrogen target removal met? Yes
Total phosphorus target removal met? Yes

Summary Report

Nitrogen

Surface Water Discharge

Total N pre load .12 kg/yr
Total N post load 7.94 kg/yr
Target N load reduction 80 %

Target N discharge load 1.59 kg/yr Percent N load reduction 83 %

Provided N discharge load 1.36 kg/yr 2.99 lb/yr Provided N load removed 6.58 kg/yr 14.52 lb/yr

Phosphorus

Surface Water Discharge

Total P pre load .003 kg/yr
Total P post load 1.321 kg/yr
Target P load reduction 55 %

Target P discharge load .594 kg/yr Percent P load reduction 83 %

Provided P discharge load .226 kg/yr .5 lb/yr Provided P load removed 1.095 kg/yr 2.415 lb/yr

VIII. GEOTECHNICAL INVESTIGATION



GEOTECHNICAL ENGINEERING REPORT

Vet Clinic & Retail

Howey in the Hills, Lake County, Florida

August 28, 2024

Prepared for: **Z Development Services**708 East Colonial Drive, Suite 100

Orlando, FL 32803

Attn: Mr. Bob Ziegenfuss, P.E.

Prepared by:

Geo-Technology Associates, Inc.

Geotechnical and Environmental Consultants

4617 Parkbreeze Court Orlando, Florida 32808 (321) 482-4239 www.gtaeng.com

GTA Project No: 31232169

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

August 28, 2024



708 East Colonial Drive, Suite 100 Orlando, FL 32803

Attn: Mr. Bob Ziegenfuss, P.E.

bob@zdevelopmentservices.com

Re: Geotechnical Engineering Report

Vet Clinic & Retail

Howey in the Hills, Lake County, Florida

In accordance with our revised subconsultant agreement dated July 26, 2024, Geo-Technology Associates, Inc. (GTA) has performed a geotechnical exploration for the proposed vet clinic and retail development planned in Lake County, Florida. The subject site is located west of US-19 and south of Revels Road in Howey in the Hills, Lake County, Florida.

The results of the field and laboratory testing and our findings and conclusions regarding the geotechnical implications of the existing site conditions within the subject property are included in this report. Please note that, unless you make other arrangements, GTA will discard all soil samples obtained from the explorations 10 days after the date of this report. If you have any questions or concerns about this report, or if you want additional information, please contact us at (321) 482-4239 or GPillappa@gtaeng.com.

Sincerely,

GEO-TECHNOLOGY ASSOCIATES, INC. Certificate of Authorization No. 35088

Gautham S. Pillappa, P.E.

Gautham Pi lapp

Vice President

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Florida. License No.: 82816, Expiration Date: 02/28/2025. GSP

4617 Parkbreeze Court, Orlando, FL 32808 (321) 482-4239

TABLE OF CONTENTS

1.0	SUMMARY OF FINDINGS AND RECOMMENDATIONS	1
2.0	INTRODUCTION	2
2.1	Study Purpose	2
2.2	REFERENCED DOCUMENTS	
3.0	PROJECT DESCRIPTION	2
3.1	SITE LOCATION	2
3.2	Existing Site Conditions	2
3.3	Proposed Construction	3
4.0	GEOTECHNICAL ENGINEERING STUDY	3
4.1	GEOLOGIC REVIEW	3
4.2	Subsurface Exploration Scope	
4.3	Subsurface Conditions	
4	3.1 Groundwater	
4.4	LABORATORY TESTING	
5.0	CONCLUSIONS AND RECOMMENDATIONS	4
5.1	Site Grading	_
0	1.1 Groundwater	
	1.2 Fill Placement	
5.2	Foundations	
5	2.1 Foundation Design	
5	2.2 Foundation Construction Considerations	
5	2.3 Slab Design	
5.3	UTILITIES	
5.4	PAVEMENTS	
5.5	Stormwater Pond	
6.0	LIMITATIONS	ç

Important Information About This Geotechnical Engineering Report

Appendix A – Figures

Figure No. 1 Site Location Map (1 Sheet, color)
Figure No. 2 Site Aerial (1 Sheet, color)
Figure No. 3 Site Geologic Map (1 Sheet, color)
Figure No. 4 Exploration Location Plan (1 Sheet, 24"x36")

Appendix B – Exploration Logs

Notes for Exploration Logs (1 Sheet) SPT Boring Logs

1.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

We have prepared this summary for the user's convenience only. Do not rely on it exclusively for any decision-making purpose. Please review the full text of the report which addresses each topic in further detail.

TOPIC	DESCRIPTION			
Site Attributes				
Existing Conditions	Undeveloped area with land cover consisting of short grass, vegetation and some trees.			
<u>Proposed</u> <u>Construction</u>	Commercial/medical office building with associated parking/driveway and stormwater areas.			
	Conditions Encountered			
<u>Topsoil</u>	3 to 6 inches thick.			
Existing Fills	No buried debris/organic material/deleterious material was observed in the borings.			
Native Soils	Very loose to dense fine SAND with varying fines content [SP, SP-SC, SC].			
<u>Groundwater</u>	Observed at about 9 feet bgs.			
	Recommendations			
Site Preparation	Mass grade site, including tree removal and root raking, grubbing and proof rolling.			
Croundwater	Observed at about 9 feet bgs during drilling.			
<u>Groundwater</u>	Commonly used temporary dewatering techniques (e.g., sumps etc.) will be sufficient.			
Fill Material Criteria	Most of the excavated soils will be suitable for reuse as fills [SP, SP-SC].			
	Place fill in maximum 12-inch (loose-measure) lifts.			
Fill Placement	Compact to minimum 95% of max. dry density (Modified Proctor) for structural fills.			
<u>Requirements</u>	• Compact to minimum 98% of max. dry density (Modified Proctor) for top 12 in. of pavement			
	subgrade.			
	Net allowable soil-bearing pressure: 2,500 psf.			
<u>Foundations</u>	Minimum widths: 12 inches (wall footings); 24 inches (column footings).			
	• Maximum anticipated settlements: 1 inch total; ½ inch differential between columns.			
	Use of a sheet vapor barrier (in accordance with Florida Building Code requirements) is			
<u>Slabs</u>	recommended.			
<u>318.03</u>	Conventional floor slabs may be supported upon the compacted fill and should be			
	structurally isolated from other foundation elements or adequately reinforced			
Utilities	Firm natural soils or newly placed compacted fills are considered suitable for support of utility			
<u>otinties</u>	pipe systems.			
<u>Pavements</u>	For flexible (asphalt) pavements, we recommend using a 3-layer section consisting of			
<u>r avernents</u>	compacted subgrade (sub-base), base course and surface wearing course.			
Stormwater Pond	We understand that the stormwater for this project will be managed by an underground			
Stormwater Polid	exfiltration area.			

*bgs = below existing ground surface



2.0 INTRODUCTION

Z Development Services ("Client") is in the design phase of development at the subject property as commercial/medical office building in Howey in the Hills, Lake County, Florida. GTA has performed a geotechnical study and prepared this report for Z Development Services in accordance with our sub consultant agreement, prepared in June 2023.

2.1 Study Purpose

GTA conducted this study to develop confirmation-dependent geotechnical engineering recommendations for the commercial development planned for the Vet Clinic & Retail project. The scope of GTA's study was limited to the property boundary and referred to as the "Project Site".

2.2 Referenced Documents

GTA was provided with an ALTA/NSPS Land Title Survey, dated July 29, 2023, prepared by Ireland & Associates Surveying, Inc and the Conceptual Plan, dated January 23, 2024, and prepared by Z Development Services (this plan also showed the boring locations). The plan indicates the site boundaries and conceptual site layout of the proposed development and associated improvement areas.

3.0 PROJECT DESCRIPTION

3.1 Site Location

The subject site is located west of US-19 and south of Revels Road in Howey in the Hills. Refer to the USGS Site Location Map and Site Aerial, which are Figures 1 and 2 in Appendix A of this report.

3.2 Existing Site Conditions

At the time of our field work, the subject property was undeveloped land with ground cover consisting of short grass, vegetation and some trees.

Based on our visual observations and review of ground surface topography (USGS Maps and Google Earth), the site elevations vary between +80 and +100 feet National Geodetic Vertical Datum (NGVD). Based on the survey provided, the water body adjacent west of the property has an elevation of +81 feet (NGVD).



3.3 Proposed Construction

We understand that the building will be 1-story. At the time of this report, we understand that the Finish Floor Elevation (FFE) has not been established and a Grading Plan was not available for our review.

The structure is assumed to be masonry construction and slab-on-grade. We assume that the structure will have maximum column loads of up to 30 kips, and bearing wall loads of up to about 5 kips per linear foot.

4.0 GEOTECHNICAL ENGINEERING STUDY

4.1 Geologic Review

The site, as shown on the Geologic Map of the USGS Orlando, Florida lies within the Cypresshead Formation. This is characterized by poorly consolidated, fine to coarse grained, clayey to clean sands with variable quartz. Refer to the Geologic Map, included as Figure No. 3, within Appendix A for further information on the site geology.

4.2 Subsurface Exploration Scope

As requested, GTA's geotechnical exploration consisted of a total of eight (8) borings; two (2) of the SPT borings were performed within the proposed building area to a depth of 20 feet, four (4) within the general vicinity of the proposed parking/pavement areas to a depth of 10 feet and the remaining two (2) SPT borings were performed within the pond area to a depth of 15 feet below the existing surface. The borings were performed by GTA in August 2024 using a truck drill rig and safety hammer. The exploration locations were selected by GTA and located in the field using a hand-held GPS unit and the existing site features as reference. No survey control was provided to us; hence the boring locations should be considered approximate to the degree of the methodologies used.

The approximate locations of the explorations performed for this study are shown on the Exploration Location Plan, which is included as Figure 4 in Appendix A. Detailed descriptions of the encountered subsurface conditions are indicated on the Boring Logs, which are included in Appendix B.

Standard Penetration Testing (SPT) was performed in the borings in accordance with procedures of ASTM D1586. Soil samples were obtained at two- to five-foot intervals within the boreholes. The SPT involves driving a 2-inch O.D., 1%-inch I.D. split-spoon sampler with a 140-pound hammer free-falling from a height of 30 inches. The number of blows required to drive the sampler was recorded in sixinch intervals. The SPT N-value, given as blows per foot, is defined as the total number of blows required to drive the sampler from the 6- to 18-inch interval.



The samples retrieved from the explorations were delivered to GTA's laboratory for visual classification by a geotechnical engineer and limited laboratory testing. The soil descriptions indicated on the logs are based on visual observations of the individual soil samples as summarized in the Notes for Exploration Logs included in Appendix B, supplemented by the laboratory test results.

We note that the recovered samples from the SPT borings were not evaluated for chemical composition, environmental hazards or karst concerns. GTA can provide you with a proposal for these services if needed.

4.3 Subsurface Conditions

The conditions encountered in GTA's subsurface explorations generally confirmed the descriptions presented in the Site Geology section of this report. The topsoil layer was encountered as short grasses extending 3- to 6-inches below grade. Below the topsoil, the borings encountered very loose to dense sandy soils with varying fines content [SP, SP-SC, SC]. Blow counts (SPT N-values) varied from 2 blows per foot (bpf) to 50 bpf.

4.3.1 Groundwater

Groundwater was encountered during drilling at a depth of approximately 9 feet below existing grades. We estimate that the seasonal high groundwater level may form at depths between 3.5 and 5.5 feet below grade, depending on location. Please note that the seasonal high is an estimate and does not provide any assurance that the groundwater will not exceed this level in the future. Changes in subsurface conditions, rainfall intensity and time durations, on-site or off-site changes etc. can all impact the seasonal high groundwater level.

4.4 Laboratory Testing

GTA performed laboratory testing for this study included gradation analyses for classification of the soils in accordance with the Unified Soil Classification System (USCS), fines content, and natural moisture content determinations. The results of our laboratory testing are shown on the boring logs.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of the geotechnical engineering study, it is GTA's professional opinion that the subsurface conditions at the project site are generally suitable for construction of the proposed development, provided the following geotechnical engineering recommendations are adhered to, and that applicable standard of care is maintained during construction. GTA's recommendations for foundations, utilities, pavements, and other geotechnical considerations are presented in the following paragraphs.



5.1 Site Grading

Prior to the placement of any controlled, compacted fill, the area to receive fill should be stripped of any deleterious material (including trees, structures, existing utilities etc.). GTA anticipates greater stripping thicknesses may be required where tree roots extend several feet below the ground surface. The actual stripping thickness will be dependent on the season of construction, soil moisture, depth of topsoil development, and contractor care.

5.1.1 Groundwater

Groundwater was encountered during drilling at a depth of approximately 9 feet below existing grades. Depending on season, groundwater may slightly impact site grading activities depending on excavation depths. Groundwater levels may fluctuate with seasonal variations in precipitation. The contractor should be prepared to dewater and shore excavations during construction.

5.1.2 Fill Placement

Once grubbed, the entire site should then be proof-rolled to identify any loose, soft, wet, or otherwise unsuitable subgrade. Any surficial materials identified as unstable or unsuitable should be undercut to a stable stratum and backfilled with controlled, compacted fill as recommended in the field by the geotechnical engineer.

The on-site materials classified as SP and SP-SC, and to an extent SC, are considered suitable for use in structural fill construction. Structural fills should be placed and compacted in a controlled manner in accordance with project and county specifications. The proof rolling of fill subgrades, undercutting of any uncontrolled or unsuitable material, and the placement of controlled, compacted fill should be observed and tested by GTA or a qualified representative.

Fills on existing slopes steeper than 5 horizontal to 1 vertical (5H:1V) should be benched into the slope at 3- to 4-foot intervals to increase stability of the constructed fill. Cut and fill slopes should be graded to no steeper than 3H:1V unless specifically engineered. New slopes should be constructed with the most granular material available on site. Fills should be constructed in maximum 12-inch loose lifts and compacted to the following specifications:



COMPACTION SPECIFICATIONS

Structural/Fill Location	Compaction Specification
Below foundations or floor slabs, fills greater than 12 inches below private roadway/pavement subgrades and utility backfill	95% of ASTM D-1557
Top 12 inches of private roadway subgrades	98% of ASTM D-1557

Fills should generally be placed within 2 to 4% of the optimum moisture content. Earthwork should be observed/tested by an engineering technician working under the supervision of a registered professional engineer and all compactive effort should be verified by in-place density testing.

5.2 Foundations

Our analysis assumed that the structures may have maximum column loads of up to 30 kips, and bearing wall loads of up to about 5 kips per linear foot.

5.2.1 Foundation Design

Based on our analysis, the proposed buildings may be supported on conventional shallow spread foundations established on natural granular soils proportioned for a net allowable soil bearing pressure of 2,500 pounds per square foot (psf).

For continuous wall or slab on grade footings, the minimum footing width should comply with the current FLBC, but should not be less than 12 inches and column footings of 24 inches are recommended. Maximum settlement on the order of 1 inch total and ½ inch differential can be anticipated, based upon this design and assumed structural loads. These values are generally within the acceptable tolerance for similar structures. Exterior footings should be founded a minimum of 18 inches below final exterior grade.

5.2.2 Foundation Construction Considerations

Footings should be supported on soils which exhibit a density of at least 95 percent of the maximum dry density as determined by ASTM D 1557 (Modified Proctor) to a depth of at least 2 feet below grade.

Footing excavations should be observed by a professional engineer or his qualified representative prior to concrete placement. Density testing should be performed on exposed footing subgrade to confirm the degree of compaction. Footings should be concreted on the day they are excavated to prevent excessive disturbance and/or moisture increase.



5.2.3 Slab Design

For the slab design, we recommend using a subgrade modulus (k) of 125 pounds per cubic inch, which can be achieved by compacting the subgrade soils as recommended in this report. GTA recommends the use of a sheet vapor barrier (in accordance with Florida Building Code requirements) beneath the building slab-on-grade to help control moisture migration through the slab. Conventional floor slabs may be supported upon the compacted fill and should be structurally isolated from other foundation elements or adequately reinforced to prevent distress due to differential movements.

5.3 Utilities

Detailed utility plans showing utility invert elevations were not available at the time of this report. GTA assumes that the proposed sewer/storm lines are generally planned less than 15 feet below proposed roadway grades. Based on the results of the borings, excavations of 10 to 15 feet below existing grades can generally be accomplished using standard excavation techniques.

The firm natural soils or newly placed compacted fills are considered suitable for support of utility pipe systems. Any soft or unstable soils present at the utility subgrade should be over-excavated and replaced with controlled compacted fill. If groundwater or plastic soils are encountered at the invert elevation, a 6-inch granular bedding should be placed to provide more uniform support. The decision to place this granular bedding layer should be made by GTA in the field based on actual site conditions encountered during construction.

Groundwater may be encountered during utility excavations. The utility contractor should be prepared to provide adequate dewatering and earth support systems during utility construction. Utility pipe systems below pavements and other structural areas should be backfilled using controlled, compacted fill. The most granular available soils should be used as utility backfill. The backfill should be constructed as described in the Site Grading section of this report. Lift thicknesses must be reduced to 6 inches when compacting with lightweight equipment around structures. Due to the potential for encountering groundwater, proper compaction of the utility backfill may be difficult to achieve, especially during the rainy season. Moisture conditioning of the on-site soils maybe necessary. Therefore, GTA recommends that the Client establish a contingency for utility backfill.

5.4 Pavements

Detailed traffic-loading information was not available to GTA at the time this report was prepared. Based on experience with similar projects, GTA has assumed that traffic will mainly be typical light-duty with some heavy-duty traffic (garbage trucks, delivery/moving trucks, etc.). Hence, we assume that a combination of rigid and flexible pavement types will be built for this project.



For flexible (asphalt) pavements, GTA recommends using a 3-layer section consisting of compacted subgrade (sub-base), base course and surface wearing course. For a light-duty section, we recommend a 1.5-inch-thick asphalt layer, underlain by 6 inches of base and 12 inches of stabilized subgrade. For a heavy-duty section, we recommend a 2.5-inch-thick asphalt layer, underlain by 8 inches of base and 12 inches of stabilized subgrade. These thicknesses should be confirmed to meet local County/City requirements during design by the Civil Engineer.

GTA recommends that the stabilized subgrade beneath the base course exhibit a minimum Limerock Bearing Ratio (LBR) of 40 as specified by FDOT compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557) value. Stabilized subgrade can be imported materials or a blend of on-site and imported materials.

The base course can either be limerock, soil cement or Recycled Concrete Aggregate (RCA).

- Limerock The limerock will need to comply with the latest edition of the FDOT Road and Bridge Construction specifications and should be compacted to 98 percent of the maximum dry density as determined by ASTM D 1557 (Modified Proctor) and should have a minimum LBR value of 100.
- Soil Cement The mix design for soil cement should have a minimum 7-day strength of 300 to 500 psi. This material should be placed in 6-inch lifts and compacted to 95 percent of the maximum dry density in accordance with ASTM D-558 (Moisture Density Relations of Soil Cement Mixtures). Placing and finishing should be in accordance with Portland Cement Association requirements. Please note that shrinkage cracks may form in the long-term resulting in reflection cracking at the surface.
- Recycled Concrete Aggregate (RCA) This base material should be sourced from a FDOT approved supplier. The minimum LBR requirement for this base is 150 and it should be compacted to 98 percent of the maximum dry density as determined by ASTM D 1557 (Modified Proctor).

For the wearing course, GTA recommends FDOT SuperPave (SP) asphalt. FDOT SP-9.5 should be used for light-duty areas and SP-12.5 with an overlay of SP-9.5 should be used for heavy-duty areas. The asphalt course should be in accordance with the latest edition of the FDOT Road and Bridge Construction specifications.

It is very critical to evaluate the separation between the pavement base course and the seasonal high groundwater level. Sufficient separation will need to be maintained between the bottom of base course and the anticipated seasonal high groundwater level in accordance with local County/City requirements. We recommend that the seasonal high groundwater and the bottom of the base course be separated by at least 18 to 24 inches (in accordance with jurisdictional requirements). The separation should be confirmed by reviewing the final grading plan.



5.5 Stormwater Pond

We understand that the stormwater for this project will be managed by a pond. GTA performed two (2) borings, designated as G-03 and G-04, within this area. Our design parameters are summarized in the following table. Appropriate factors of safety should be incorporated in the final design.

COMPACTION SPECIFICATIONS

Design Parameters	Estimated Values									
Boring Log	G-03	G-04								
Ground Surface Elevation (ft, datum)	+ 91.0	+89.4								
Depth to Base of Surficial Aquifer (ft)	8	4								
Estimated Fillable Porosity (%)	25	25								
Estimated Seasonal High GWT (ft)	5.5	3.5								
Estimated Horizontal Saturated Hydraulic Conductivity, Kh (ft/day)	40	40								
Estimated Vertical Unsaturated Hydraulic Conductivity, Kv (ft/day)	26	26								

Please note that ground surface elevation above has been approximated from a partial topographic survey performed by Ireland & Associates Surveying, Inc. (dated July 29, 2023). If the above parameters do not provide adequate recovery, the clayey sand [SC] layer can be over-excavated and replaced with clean fine sand [SP] (fines less than 2 percent) to provide higher permeability and lower the depth to base of aquifer.

The slopes and bottom of the pond should be stabilized in accordance with applicable Water management District and County/City guidelines.

6.0 LIMITATIONS

This report, including all supporting boring logs, field data, field notes, laboratory test data, calculations, estimates and other documents prepared by GTA in connection with this project have been prepared for the exclusive use of Z Development Services pursuant to agreements between GTA



and Z Development Services in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein. Use and reproduction of this report by any other person without the expressed written permission of GTA and Z Development Services is unauthorized and such use is at the sole risk of the user.

The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. Test borings indicate soil conditions only at specific locations and times and only at the depths penetrated. They do not necessarily reflect strata or variations that may exist between test boring locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations of subsurface conditions from those described in this report are noted during construction, recommendations in this report may need to be reevaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. GTA is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of Geo-Technology Associates, Inc.

The scope of our services for this geotechnical exploration did not include any environmental assessment or investigation for the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the logs regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our client.

This report and the attached logs are instruments of service. The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter shall not be construed by the reader to imply approval by the writer.



Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you - assumedly a client representative - interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will <u>not</u> likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do <u>not</u> rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it;
 e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do <u>not</u> rely on an executive summary. Do <u>not</u> read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- · the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- · the composition of the design team; or
- · project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnicalengineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- · confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.



Telephone: 301/565-2733

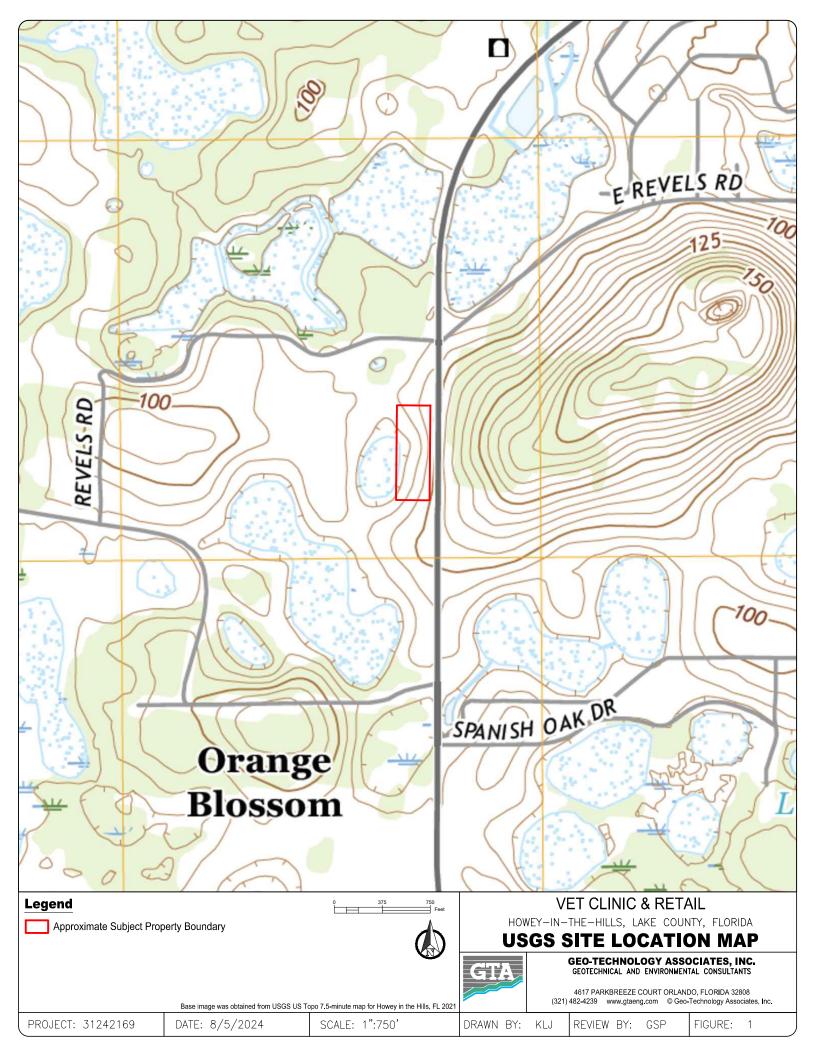
e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2019 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document or its wording as a complement to or as an element of a report of any kind. Any other firm, individual, or other entity that so uses this document without being a GBA member could be committing negligent



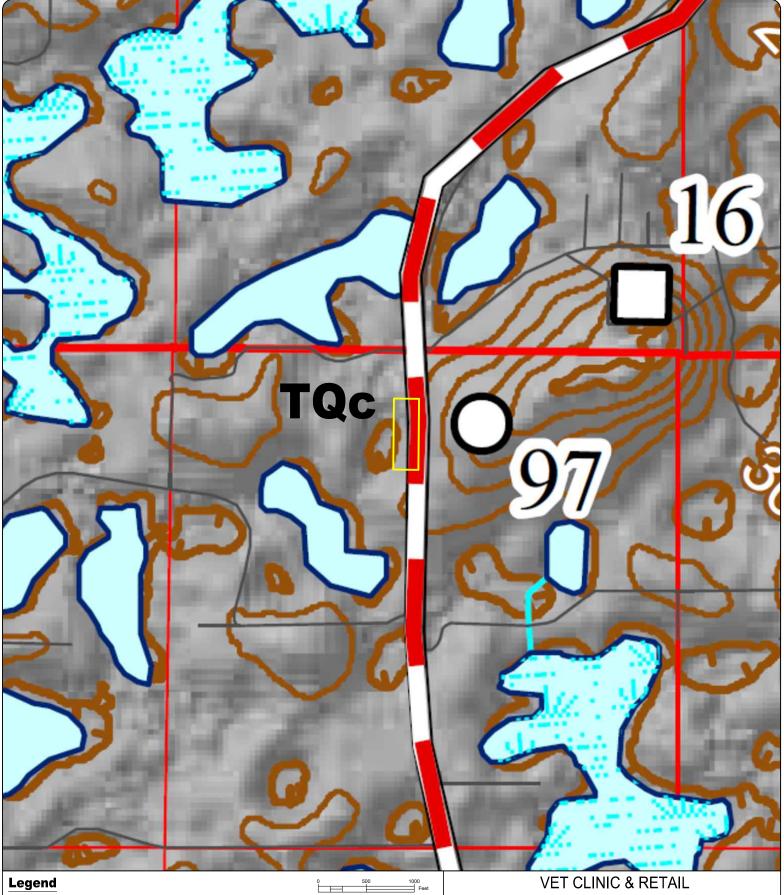
APPENDIX A

FIGURES





PROJECT: 31242169 DATE: 8/5/2024 SCALE: 1":150' DRAWN BY: KLJ REVIEW BY: GSP FIGURE: 2



Approximate Subject Property Boundary

Cypreshead Formation (TQc) - The Pilocone Pleistonee Oppreshead Formation (TQc) is a motified reddish-brown to reddish-orange to while, unconsolidated to poorly consolidated, fine to very coarse-grained, variably dayey to dean quartz sand. Crossbedded sands and bimodal sand size distributions are common within this formation. Discoid quartity pebbles, heavy mineral grains, mica, and ghosts of nearshore marine mollutoss are often present. The Cypresshead Formation is present throughout much of the study area and form is to core of the various ridges present in the region. In the ortherastern protion of the study area, east of the St. Johnse, it lytically becomes a more weathered, finergrained, well-sorted sand and sit. In cores, the unit is often characterized by bads of fine grained, well-sorted sand with thin layers of clay dispersed through the sand.

HOWEY-IN-THE-HILLS, LAKE COUNTY, FLORIDA

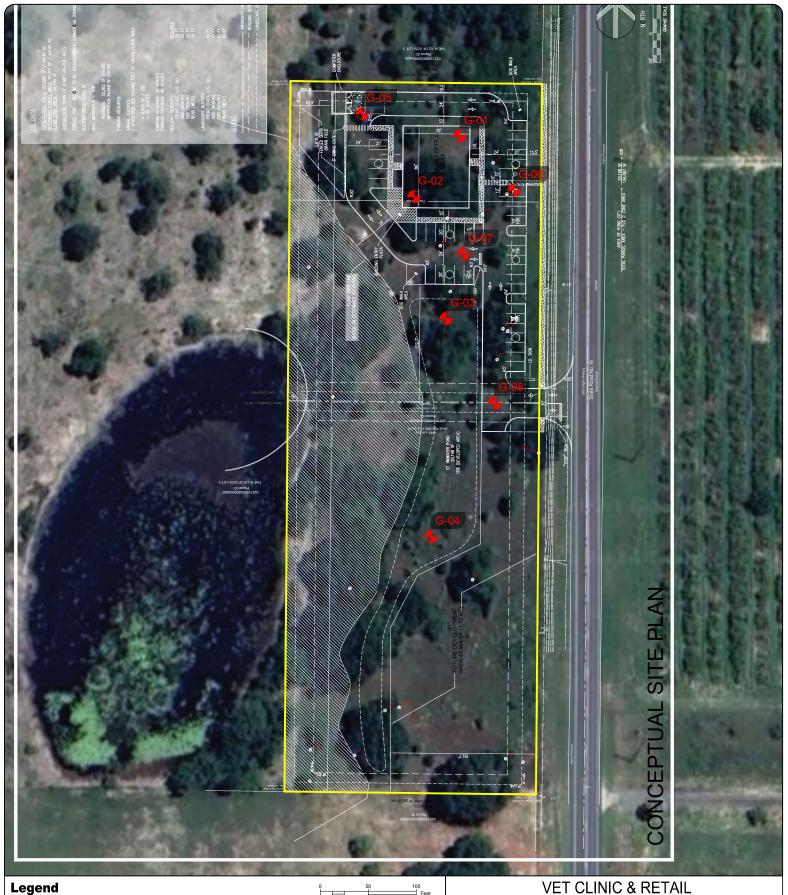
GEOLOGIC MAP

GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

4617 PARKBREEZE COURT ORLANDO, FLORIDA 32808 (321) 482-4239 www.gtaeng.com © Geo-Technology Associates, Inc.

Base map & legend obtained from the Florida Geologic Survey, Open File Map series 107, plate 1

SCALE: 1":1000' PROJECT: 31242169 DATE: 8/5/2024 DRAWN BY: KLJ REVIEW BY: GSP FIGURE: 3







Borings G-01 through G-08 were staked and drilled in Aug. 2024 using hand held GPS devices. No survey control was provided.

Approximate Subject Property Boundary

HOWEY-IN-THE-HILLS, LAKE COUNTY, FLORIDA

EXPLORATION LOCATION PLAN



GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

4617 PARKBREEZE COURT ORLANDO, FLORIDA 32808 (321) 482-4239 www.gtaeng.com © Geo-Technology Associates, Inc.

Google Imagery ©2024 Airbus, Maxar Technologies, U.S. Geological Survey, Map data ©2024

PROJECT: 31242169 DATE: 8/5/2024 SCALE: 1":100' DRAWN BY: KLJ REVIEW BY: GSP FIGURE:



APPENDIX B EXPLORATION LOGS

NOTES FOR EXPLORATION LOGS

KEY TO USCS TERMINOLOGY AND GRAPHIC SYMBOLS

	MAJOI	SYMI	SYMBOLS									
	(BASED L	GRAPHIC	LETTER									
	GRAVEL AND	CLEAN GRAVEL			GW	Well-Graded GRAVEL						
	GRAVELLY SOILS	(LESS THAN 5% PASSING T	HE NO. 200 SIEVE)		GP	Poorly Graded GRAVEL						
COARSE-	MORE THAN 50% OF COARSE FRACTION	GRAVELS V FINES	VITH		GM	Silty GRAVEL						
GRAINED SOILS	RETAINED ON NO. 4 SIEVE	(MORE THAN 15% PASSING	THE NO. 200 SIEVE)		GC	Clayey GRAVEL						
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE	SAND AND	CLEAN SA	NDS		SW	Well-Graded SAND						
SIZE	SANDY SOILS	(LESS THAN 5% PASSING 1	THE NO. 200 SIEVE)		SP	Poorly Graded SAND						
	MORE THAN 50% OF COARSE FRACTION	SANDS W FINES	ITH		SM	Silty SAND						
	PASSING ON NO. 4 SIEVE	(MORE THAN 15% PASSING	THE NO. 200 SIEVE)		SC	Clayey SAND						
			SILTS		ML	SILT						
FINE-	SIL	T OR CLAY	AND LEAN CLAYS		CL	Lean CLAY						
GRAINED SOILS	l '	D ON THE NO. 200 SIEVE) VITH SAND OR GRAVEL	LIQUID LIMIT LESS THAN 50		OL							
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE	SANDY OR GR	INED ON THE NO. 200 SIEVE) AVELLY SILT OR CLAY	ELASTIC SILTS		МН	Elastic SILT						
SIZE	(>30% RETAINE	D ON THE NO. 200 SIEVE)	AND FAT CLAYS LIQUID LIMIT		СН	Fat CLAY						
			GREATER THAN 50		ОН							
	HIGHLY ORGANIC SOILS											

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS WHICH CONTAIN AN ESTIMATED 5 TO 15% FINES BASED ON VISUAL CLASSIFICATION OR BETWEEN 5 AND 12% FINES BASED ON LABORATORY TESTING; AND FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSS-HATCHED AREA, FINE-GRAINED SOILS ARE CLASSIFIED AS ORGANIC (OL OR OH) WHEN ENOUGH ORGANIC PARTICLES ARE PRESENT TO INFLUENCE ITS PROPERTIES. LABORATORY TEST RESULTS ARE USED TO SUPPLEMENT SOIL CLASSIFICATION BY THE VISUAL-MANUAL PROCEDURES OF ASTM D 2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

	DESCRIF	GRAPHIC SYMBOLS	
	TOPSO	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	
ADDITIONAL DESIGNATIONS	MAN MADE		
	GLACIAL ⁻		
	COBBLES AND B	0.0.0.0	
	DESCRIPTION	"N" VALUE	
RESIDUAL SOIL DESIGNATIONS	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR LESS THAN 1" OF PENETRATION, AUGER PENETRABLE	

COARSE-GRAINED SOILS (GRAVEL AND SAND)

DESIGNATION	BLOWS PER FOOT (BPF) "N"
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	>50

NOTE: "N" VALUE DETERMINED AS PER ASTM D 1586

FINE-GRAINED SOILS (SILT AND CLAY)

CONSISTENCY	BPF "N"
VERY SOFT	<2
SOFT	2 - 4
MEDIUM STIFF	5 - 8
STIFF	9 - 15
VERY STIFF	16 - 30
HARD	>30

NOTE: ADDITIONAL DESIGNATIONS TO ADVANCE SAMPLER INDICATED IN BLOW COUNT COLUMN: WOH = WEIGHT OF HAMMER WOR = WEIGHT OF ROD(S)

SAMPLE TYPE

DESIGNATION	SYMBOL
SOIL SAMPLE	S-
SHELBY TUBE	U-
ROCK CORE	R-

WATER DESIGNATION

DESCRIPTION	SYMBOL
ENCOUNTERED DURING DRILLING	\sqsubseteq
UPON COMPLETION OF DRILLING	Y
24 HOURS+ AFTER COMPLETION	T

NOTE: WATER OBSERVATIONS WERE MADE AT THE TIME INDICATED. POROSITY OF SOIL STRATA, WEATHER CONDITIONS, SITE TOPOGRAPHY, ETC. MAY CAUSE WATER LEVEL CHANGES.

PROJECT: Vet Clinic & Retail

PROJECT NO.: 31232169

PROJECT LOCATION: Howey in the Hills, Lake Country, FL

WATER LEVEL (ft): 9.0

8/1/2024

CAVED (ft): CAVED (f

DATE STARTED: 8/1/2024 WATER ENCOUNTERED DURING DRILLING (ft) $\stackrel{\smile}{=}$ 9.0 DATE COMPLETED: 8/1/2024 GROUND SURFACE ELEVATION:

DATE COMPLETED: **8/1/2024** GROUND SURFACE ELEVATION: DRILLING CONTRACTOR: **TG** DATUM:

DRILLER: TG EQUIPMENT: Beaver Truck

DRILLING METHOD: Mud Rotary

SAMPLING METHOD: Split Spoon/Manual Hammer

LOGGED BY: SHG
CHECKED BY: GSP

-		<u> </u>	ю. Эріі і	. Opos	JII/ IVIGI	iuui i	iaiiii		CHECKED BY	GSP
SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	nscs	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
									DESCRIPTION	KEWAKKS
S-1	0.0		НА	НА	0.0	0 —	SP		Light brown, dry, poorly graded fine SAND.	
S-2	2.0		НА	НА	4.0	=				
S-3	4.0		2-3-10-14	13	-4.0	5 –	SC		Orange, wet, medium dense, poorly graded clayey fine SAND.	M/C= 16% F/C= 43%
S-4	6.0		15-23-27- 31	50		-			Same, dense	
S-5	8.0		22-20-25- 30	45		10 -				<u>T</u>
S-6	13.5		5-7-6	13		 15 			Same, white, medium dense	M/C= 26%
S-7	18.5		4-6-6	12	-20.0	20			Boring terminated at 20 feet.	F/C= 16%

NOTES: HA= Hand Auger



GEO-TECHNOLOGY ASSOCIATES, INC.

LOG OF BORING NO. G-01

4617 Parkbreeze Court Orlando, FL 32808

PROJECT: Vet Clinic & Retail
PROJECT NO.: 31232169

PROJECT LOCATION: Howey in the Hills, Lake Country, FL

WATER LEVEL (ft):

9.0

8/1/2024

CAVED (ft):

CAVED (ft):

CAVED (ft):

CAVED (ft):

WATER LEVEL (ft):

9.0

CAVED (ft):

CA

DATE STARTED: 8/1/2024 WATER ENCOUNTERED DURING DRILLING (ft) $\stackrel{\smile}{=}$ 9.0 DATE COMPLETED: 8/1/2024 GROUND SURFACE ELEVATION:

DATE COMPLETED: **8/1/2024** GROUND SURFACE ELEVATION: DRILLING CONTRACTOR: **TG** DATUM:

DRILLER: TG EQUIPMENT: Beaver Truck

DRILLING METHOD: Mud Rotary
SAMPLING METHOD: Split Spoon/Manual Hammer

LOGGED BY: SHG
CHECKED BY: GSP

SAMPLE NUMBER SAMPLE DEPTH (ft.) SAMPLE DEPTH (ft.) SAMPLE DEPTH (ft.) N (blows/ft.) USCS GRAPHIC SYMBOL SYMBOL OLITHING SYMBOL	REMARKS
DESCRIPTION	KEIVIARKS
S-1 0.0 HA HA O.0 O SP Gray, dry, poorly graded fine SAND.	
S-2 2.0 HA HA	
S-3 4.0 1-1-1-2 2 5 Same, light brown, very loose	
S-4 6.0 4-4-4-5 8 SP- Light brown, moist, loose, poorly graded fine clay.	
S-5 8.0 7-10-8-7 18 SC Light brown, moist, medium dense, poorly grading fine SAND.	raded clayey M/C= 9% ▼/C= 22%
S-6 13.5 6-10-8 18 Same, white, wet, medium dense	M/C= 14% F/C= 19%
Same, dense	
S-7 18.5 11-14-17 31 -20.0 20 Boring terminated at 20 feet.	
25 -	
30_	

NOTES: HA= Hand Auger



GEO-TECHNOLOGY ASSOCIATES, INC.

LOG OF BORING NO. G-02

4617 Parkbreeze Court Orlando, FL 32808

PROJECT: Vet Clinic & Retail

PROJECT NO.: 31232169

PROJECT LOCATION: Howey in the Hills, Lake Country, FL

WATER LEVEL (ft): 9.0

8/1/2024

CAVED (ft): CAVED (f

DATE STARTED: 8/1/2024 WATER ENCOUNTERED DURING DRILLING (ft) $\stackrel{\smile}{=}$ 9.0 DATE COMPLETED: 8/1/2024 GROUND SURFACE ELEVATION:

DATE COMPLETED: **8/1/2024** GROUND SURFACE ELEVATION: DRILLING CONTRACTOR: **TG** DATUM:

DRILLER: TG EQUIPMENT: Beaver Truck

DRILLING METHOD: Mud Rotary

SAMPLING METHOD: Split Spoon/Manual Hammer

LOGGED BY: SHG
CHECKED BY: GSP

O/ 11V	II EII 1	O IVIL III	טט: סףוו ו	t Opot	Jii/iviai	iuui i	IUIIII		CHECKED BY:	GSF
SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	nscs	GRAPHIC SYMBOL		
		_	_						DESCRIPTION	REMARKS
S-1	0.0		НА	НА	0.0	0 -	SP		Gray, dry, poorly graded fine SAND.	
S-2	2.0		НА	НА		=				
S-3	4.0		1-1-3-3	4		5 –			Same, light brown, very loose	M/C= 4% F/C= 2% K= 40 ft/day
S-4	6.0		5-4-6-5	10		_			Same, loose	
S-5	8.0		6-7-8-7	15	-8.0	10 -	SC		Orange, moist, medium dense, poorly graded clayey fine SAND.	<u>▼</u>
S-6	13.5		4-5-7	12	-15.0	10			Boring terminated at 15 feet.	

NOTES: HA= Hand Auger



GEO-TECHNOLOGY ASSOCIATES, INC.

LOG OF BORING NO. G-03

4617 Parkbreeze Court Orlando, FL 32808

PROJECT: Vet Clinic & Retail

PROJECT NO.: 31232169

PROJECT LOCATION: Howey in the Hills, Lake Country, FL

WATER LEVEL (ft): 9.0

8/1/2024

CAVED (ft): CAVED (f

DATE STARTED: 8/1/2024 WATER ENCOUNTERED DURING DRILLING (ft) $\frac{1}{2}$ 9.0 DATE COMPLETED: 8/1/2024 GROUND SURFACE ELEVATION:

DATE COMPLETED: **8/1/2024** GROUND SURFACE ELEVATION: DRILLING CONTRACTOR: **TG** DATUM:

DRILLER: TG EQUIPMENT: Beaver Truck

DRILLING METHOD: Mud Rotary

SAMPLING METHOD: Split Spoon/Manual Hammer

LOGGED BY: SHG
CHECKED BY: GSP

SAM	IPLIN	GMETH	OD: Spli t	t Spoo	on/Mar	nual F	lamn	ner	CHECKED BY:	GSP
SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	nscs	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
S-1	0.0		НА	НА	0.0	0 -	SP		Gray, dry, poorly graded fine SAND.	
S-2	2.0		НА	НА	-4.0	-				M/C= 3% F/C= 1% K= 40 ft/day
S-3	4.0		1-1-1-2	2	-4.0	5 -	SP- SC		Orange, moist, very loose, poorly graded fine SAND with clay.	
S-4	6.0		4-2-3-2	5		-			Same, loose	
S-5	8.0		3-4-2-3	6	-10.0	10 –			Boring terminated at 10 feet.	<u>V</u>
						15 — 15 — 20 — 25 — 30 _				

NOTES: HA= Hand Auger



GEO-TECHNOLOGY ASSOCIATES, INC.

LOG OF BORING NO. G-04

4617 Parkbreeze Court Orlando, FL 32808

PROJECT: Vet Clinic & Retail

PROJECT NO.: 31232169

PROJECT LOCATION: Howey in the Hills, Lake Country, FL

WATER LEVEL (ft): 9.0

8/1/2024

CAVED (ft): CAVED (f

DATE STARTED: 8/1/2024 WATER ENCOUNTERED DURING DRILLING (ft) $\stackrel{\smile}{=}$ 9.0 DATE COMPLETED: 8/1/2024 GROUND SURFACE ELEVATION:

DATE COMPLETED: **8/1/2024** GROUND SURFACE ELEVATION: DRILLING CONTRACTOR: **TG** DATUM:

DRILLER: TG EQUIPMENT: Beaver Truck

DRILLING METHOD: Mud Rotary
SAMPLING METHOD: Split Spoon/Manual Hammer LOGGED BY: SHG
CHECKED BY: GSP

		O IVIL II			711/ IVIGI				OHLONED D1.	<u> </u>
SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	SOSN	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
										_
S-1	0.0		НА	НА	0.0	0 -	SP		Gray, dry, poorly graded fine SAND.	
S-2	2.0		НА	НА		=				
S-3	4.0		1-2-1-1	3	6.0	5 -			Same, light brown, very loose	
S-4	6.0		5-10-14-17	24	-6.0	_	SP- SC		Orange, moist, medium dense, poorly graded fine SAND with clay.	
S-5	8.0		24-15-19- 22	34	-10.0	-				<u> </u>
					-10.0	10 -			Boring terminated at 10 feet.	
						- 15 — -				
						20 -				
						25 -				
						30 <u> </u>				

NOTES: **HA= Hand Auger**



GEO-TECHNOLOGY ASSOCIATES, INC.

LOG OF BORING NO. G-05

4617 Parkbreeze Court Orlando, FL 32808

PROJECT: Vet Clinic & Retail

PROJECT NO.: 31232169

PROJECT LOCATION: Howey in the Hills, Lake Country, FL

WATER LEVEL (ft): 9.0

8/1/2024

CAVED (ft): CAVED (f

DATE STARTED: 8/1/2024 WATER ENCOUNTERED DURING DRILLING (ft) $\frac{1}{2}$ 9.0 DATE COMPLETED: 8/1/2024 GROUND SURFACE ELEVATION:

DATE COMPLETED: **6/1/2024** GROUND SURFACE ELEVATION.

DRILLING CONTRACTOR: **TG**DATUM:

DRILLER: TG EQUIPMENT: Beaver Truck

DRILLING METHOD: Mud Rotary
SAMPLING METHOD: Split Spoon/Manual Hammer

LOGGED BY: SHG
CHECKED BY: GSP

SAIV	IPLIIN	GIVIETA	OD: Spir	t Spot	JII/IVIAI	iuai r	1411111	ner	CHECKED BY:	GSF
SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	nscs	GRAPHIC SYMBOL		
									DESCRIPTION	REMARKS
S-1	0.0		НА	НА	0.0	0 —	SP		Light brown, dry, poorly graded fine SAND.	
S-2	2.0		НА	НА		=				
S-3	4.0		1-2-1-2	3		5 -			Same, very loose	
S-4	6.0		1-2-2-2	4	-8.0	_				
S-5	8.0		3-2-9-9	11		10 -	SP- SC			<u>V</u>
					16.6	15 —			Boring terminated at 10 feet.	
						30_				

NOTES: HA= Hand Auger



GEO-TECHNOLOGY ASSOCIATES, INC.

LOG OF BORING NO. G-06

4617 Parkbreeze Court Orlando, FL 32808

PROJECT: Vet Clinic & Retail
PROJECT NO.: 31232169

PROJECT LOCATION: Howey in the Hills, Lake Country, FL

WATER LEVEL (ft):

9.0

8/1/2024

CAVED (ft):

CAVED (ft):

CAVED (ft):

CAVED (ft):

WATER LEVEL (ft):

9.0

CAVED (ft):

CA

DATE STARTED: 8/1/2024 WATER ENCOUNTERED DURING DRILLING (ft) $\stackrel{\smile}{=}$ 9.0 DATE COMPLETED: 8/1/2024 GROUND SURFACE ELEVATION:

DATE COMPLETED: **8/1/2024** GROUND SURFACE ELEVATION: DRILLING CONTRACTOR: **TG** DATUM:

DRILLER: TG EQUIPMENT: Beaver Truck

DRILLING METHOD: Mud Rotary

SAMPLING METHOD: Split Spoon/Manual Hammer

LOGGED BY: SHG
CHECKED BY: GSP

SAMPLING METHOD: Split Spoon/Manual Hammer						iuai r	141111	ner	CHECKED BY: GSP		
SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	SOSO	GRAPHIC SYMBOL	DESCRIPTION	REMARKS	
S-1	0.0		НА	НА	0.0	0 -	SP		Gray, dry, poorly graded fine SAND.		
S-2	2.0		НА	НА		-			Same, light brown		
S-3	4.0		1-1-1-2	2		5 –			Same, very loose		
S-4	6.0		2-3-3-3	6		_			Same, loose		
S-5	8.0		2-3-4-3	7		=			Same, moist	<u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>	
					-10.0	10 -			Boring terminated at 10 feet.	1	
						15 -					
						20 -					
						25 - -					
						30 _					

NOTES: **HA= Hand Auger**



GEO-TECHNOLOGY ASSOCIATES, INC.

LOG OF BORING NO. G-07

4617 Parkbreeze Court Orlando, FL 32808

PROJECT: Vet Clinic & Retail

PROJECT NO.: 31232169

PROJECT LOCATION: Howey in the Hills, Lake Country, FL

WATER LEVEL (ft):

9.0

8/1/2024

CAVED (ft):

CAVED (ft):

CAVED (ft):

CAVED (ft):

WATER LEVEL (ft):

9.0

CAVED (ft):

C

DATE STARTED: 8/1/2024 WATER ENCOUNTERED DURING DRILLING (ft) $\frac{1}{2}$ 9.0 DATE COMPLETED: 8/1/2024 GROUND SURFACE ELEVATION:

DATE COMPLETED: **8/1/2024** GROUND SURFACE ELEVATION: DRILLING CONTRACTOR: **TG** DATUM:

DRILLER: TG EQUIPMENT: Beaver Truck

DRILLING METHOD: Mud Rotary
SAMPLING METHOD: Split Spoon/Manual Hammer

LOGGED BY: SHG
CHECKED BY: GSP

		O IVIL III			oi i/ iviai				OHLONED D1.	
SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	SAMPLE BLOWS/6 inches	N (blows/ft.)	ELEVATION (ft.)	DEPTH (ft.)	NSCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
S-1	0.0		НА	НА	0.0	0 -	SP		Gray, dry, poorly graded fine SAND.	
S-2	2.0		НА	НА		-				
S-3	4.0		2-2-2-3	4	-6.0	5 -			Same, light brown, very loose	
S-4	6.0		3-2-4-2	6	-0.0	-	SP- SC		Orange, moist, loose, poorly graded fine SAND with clay.	
S-5	8.0		5-1-4-4	5		10 -				<u>T</u>
S-6	13.5		5-5-6	11	13.5	10	SC		Orange, wet, medium dense, poorly graded clayey fine SAND. Boring terminated at 15 feet.	

NOTES: **HA= Hand Auger**



GEO-TECHNOLOGY ASSOCIATES, INC.

LOG OF BORING NO. G-08

4617 Parkbreeze Court Orlando, FL 32808